Claims:

1. A system for reducing the amount of oxygen in an oxygen-containing gas within a closed environment, comprising:

a source of hydrogen gas;

a controllable means for mixing, in response to a control signal, a selected amount of said hydrogen gas with a portion of said oxygen-containing gas from said closed environment to form a first gas mixture that includes hydrogen and oxygen;

a catalyst coupled to said controllable means for receiving said first gas mixture, said catalyst causing a reaction between said hydrogen and at least a portion of said oxygen in said first gas mixture wherein a second gas mixture is formed and returned to said closed environment, said second gas mixture having a lower percentage of oxygen than said first gas mixture; and

at least one oxygen sensor positioned in said closed environment and coupled to said controllable means for generating said control signal when oxygen levels in said closed environment reach a threshold level.

2. A system as in claim 1 wherein said source contains said hydrogen gas in its pure form.

3. A system as in claim 1 wherein said source of said hydrogen gas comprises a metal hydride material.

4. A system as in claim 1 wherein a volume percentage of said hydrogen gas in said first gas mixture is less than approximately one percent.

5. A system as in claim 1 wherein said catalyst is a precious metal.

6. A system as in claim 5 wherein said precious metal is selected from the group consisting of palladium and platinum.

7. A system as in claim 1 wherein said reaction caused by said catalyst is defined by a reaction of one-half mole of said oxygen in said first gas mixture with one mole of said hydrogen in said first gas mixture to produce water vapor and heat.

8. A system for reducing the amount of oxygen in an oxygen-containing gas within a closed environment, comprising:

a source of hydrogen gas under pressure;

a controllable valve having an input and an output, said input coupled to said source, said controllable valve dispensing a variable amount of said hydrogen gas from said input to said output in accordance with a control signal;

a chamber coupled to said output of said controllable valve for receiving therein said variable amount of said hydrogen gas so-dispensed;

means coupled to said chamber for drawing a portion of said oxygen-containing gas from said closed environment into said chamber wherein said variable amount of said hydrogen gas and said portion of said oxygen-containing gas combine to form a first gas mixture that includes hydrogen and oxygen;

a catalyst coupled to said chamber for receiving said first gas mixture, said catalyst causing a water vapor-producing reaction between said hydrogen and at least a portion of said oxygen in said first gas mixture wherein a second gas mixture is formed and returned to said closed environment, said second gas mixture having a lower percentage of oxygen than said first gas mixture; and

at least one oxygen sensor positioned in said closed environment and coupled to said controllable valve for

generating said control signal when oxygen levels in said closed environment reach a threshold level.

9. A system as in claim 8 wherein a volume percentage of said hydrogen gas in said first gas mixture is less than approximately one percent.

10. A system as in claim 8 wherein said catalyst is a precious metal.

11. A system as in claim 10 wherein said precious metal is selected from the group consisting of palladium and platinum.

12. A system as in claim 8 wherein said source of said hydrogen gas under pressure is maintained outside of said closed environment.

13. A system as in claim 8 wherein said reaction caused by said catalyst is defined by a reaction of one-half mole of said oxygen in said first gas mixture with one mole of said hydrogen in said first gas mixture.

14. A system as in claim 8 further comprising a pressure sensor for measuring ambient pressure inside said closed environment, said pressure sensor coupled to said at least one oxygen sensor for adjusting said threshold level in accordance with said ambient pressure.

15. A method of reducing the amount of oxygen in an oxygen-containing gas within a closed environment, comprising the steps of:

monitoring oxygen levels in said closed environment;

generating a control signal when said oxygen levels reach a threshold level;

mixing, in response to a control signal, a selected amount of hydrogen gas with a portion of said oxygen-containing gas from said closed environment to form a first gas mixture that includes hydrogen and oxygen;

exposing said first gas mixture to a catalyst capable of causing a reaction between said hydrogen and at least a portion of said oxygen in said first gas mixture wherein a second gas mixture is formed, said second gas mixture having a lower percentage of oxygen than said first gas mixture; and

dispensing said second gas mixture into said closed environment.

16. A method according to claim 15 wherein said reaction produces water vapor.

17. A method according to claim 15 wherein a volume percentage of said hydrogen gas in said first gas mixture is less than approximately one percent.

18. A method according to claim 15 wherein said step of mixing comprises the steps of:

providing an open chamber in said closed environment; and

injecting said hydrogen gas into said open chamber under pressure to draw said oxygen-containing gas into said open chamber.

19. A method according to claim 15 further comprising the steps of:

measuring ambient pressure inside said closed environment; and

adjusting said threshold level in accordance with said ambient pressure.

Abstract

The present invention reduces the amount of oxygen in an oxygen-containing gas within a closed environment. A selected amount of hydrogen gas is mixed with a portion of the oxygen-containing gas from the closed environment to form a first gas mixture. A catalyst exposed to the first gas mixture causes a reaction between the hydrogen and at least a portion of the oxygen therein. The resulting second gas mixture, which is returned to the closed environment, has a lower percentage of oxygen. At least one oxygen sensor is positioned in the closed environment to determine when oxygen levels in the closed environment reach a threshold level. The output signal from the sensor is used to control when and/or how much hydrogen is mixed in the first gas mixture.